A.D. 1838 . . . . . N° 7618.

Manufacture of Glass.

CHANCE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES TIMMINS CHANCE, of Birmingham, in the County of Warwick, Glass Manufacturer, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Letters Patent under the Great Seal of Great Britain, bearing date at Westminster the Twenty-first day of April, in the first year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said James Timmins Chance, Her especial license, full power, sole privilege and authority, that I, the said James Timmins Chance, my exors, admors, and assigns, or such others as I, the said James Timmins Chance, my exors, admors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, my Invention of "IMPROVEMENTS IN THE MANUFACTURE OF GLASS," in which said Letters Patent is contained a proviso, that I, the said James Timmins Chance, shall cause a particular description of the nature of my said Invention, and in what manner the same is to be performed, to be inrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and atlarge appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said James Timmins Chance, do hereby declare that the nature of my Inven-

tion, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, and to the figures and letters marked thereon, that is to say:—

My Invention relates, first, to a mode of smoothing and polishing thin sheet glass which will not allow of being ground away, in order to obtain the same in level planes, as is the process of manufacturing plate glass, which being cast or blown of considerable thkicness will allow of inequalities caused by concavities and convexities and bendings or curvatures of a general substance, as well as other little irregularities of surface of a sheet of glass, being ground away, in order to produce two level planes for surfaces, which are then smoothed and polished, as is well understood by plate glass manufacturers; the object of my Invention being to remove the irregularities of surface, without grinding away irregularities arising from any bendings or curves, which may exist in the general substance of the glass; and thus I am enabled to smooth and polish thin sheet glass, which will be found valuable for glazing of windows, engravings, and pictures, and other useful purposes, having an appearance in most cases equal to, and for some purposes, such as glazing pictures and prints, in consequence of its thinness, even superior to the plate glass now manufactured, at the same time avoiding the great weight which is necessarily given to plate glass, in order that it may be of a degree of thickness which will allow of grinding away, not only surface irregularities, but also curves, bends, and other inequalities in the substance of the glass.

And, secondly, my Invention relates to an improvement in the manufacture of that description of glass called crown glass. It is well known that in the manufacture of crown glass there is produced a thick ring or external boundary to the tables of crown glass, which not only materially adds to the weight of each table, but is, in fact, prejudical to the appearance of the corner of a square of glass cut from a table, unless the ring or thick boundary of the table be removed and cut to waste.

Now, the object of the second part of my Invention is to prevent or reduce the enlarged thickness of the boundary of the circumference of tables of crown glass in the process of making such description of glass.

Having thus generally pointed out the nature of my Invention, I will proceed to explain the processes I pursue for carrying the same into practice. The kind of glass I prefer to operate on, according to the first part of my Invention, is what is called German sheet glass, which can be produced in large sheets, as is well known, and is made by blowing glass into hollow cylinders, and by cutting in a line parallel with the axis, and by subsequent

heat; each cylinder is laid open into a sheet, and is annealed; but such glass, by the act of its being laid into sheets, has certain irregularities of surface produced which did not exist when in the form of cylinders; there are also other irregularities in the general substance of the glass, it at all times retaining more or less of a bended or curved substance, however carefully and repeatedly the flattening process may be performed, which bending of the substance of the glass will, in many cases in large sheets, be found to be equal (when the sheets are laid on truly plain surfaces, to,) and in some cases exceed, the thickness of the glass, consequently such glass would not allow of grinding away to obtain even planes, nor will such thin glass allow of grinding away of much of the substance when the bending or curve, or such like irregularities, are to a much less degree than the thickness of the glass itself, and at the same time the thickness of such glass does not materially vary throughout a large sheet, but for practical purposes may be said to have parallel surfaces when the small irregularities of surface produced by bending a cylinder into a sheet are not taken into consideration, which latter it is required to have removed, in order to obtain good smooth polished surfaces to such glass, leaving the curves or bends which exist in the substance of the glass much the same as before undergoing the smoothing and polishing processes.

Description of the Process.

The first point to be obtained in treating such glass is to cause it to lie in a level plane, by taking advantage of its capability of being bent and laid even on level planes, as hereafter explained.

I take a sheet of glass which has been flatted by the ordinary means, in order to get the same as even as possible, and diminished as to its original size no further than what is necessary to make its shape rectangular. This sheet is laid on a table or surface prepared as follows:—A slate or other suitable surface of about the same superficial dimensions as the glass, and about five-eighths of an inch thick, is mounted on a wooden frame, and is ground down to a level plane. The slate is then covered entirely with a piece of leather of uniform thickness (or other suitable material), previously soaked in water. The glass, when laid on this level or plane surface, will seldom, if ever, lie flatly, so as to touch at all parts upon the table, but as the glass is flexible to a considerable extent, and may be readily bended, it is capable of being pressed down close to the damp bed or table by commencing pressure at one edge, and passing over to the other, in a somewhat similar manner to the action used in pasting a sheet of paper on to a level surface, and all air being thereby driven from under and excluded from between the glass and the bed or table on which it is

laid, the glass will be retained in this flat position by the weight of the superincumbent atmosphere, which, for ordinary thicknesses and curvatures, will be found sufficient to resist the elastic power which the glass possesses of resuming its natural form, and thus will a sheet of thin glass be obtained in a suitable plane for performing the process of smoothing and polishing, which is a mode of treatment very different to that employed in fixing (for grinding) plate glass, the grinding process applied to plate glass being in fact for the purpose of obtaining a plane surface by grinding away the substance thereof; but when a plane surface of glass is obtained to the thin glass, as above described, and when a plane surface has been obtained by grinding away the substance of plate glass, the processes of smoothing and polishing are very similar for each description of glass, the variation of the processes being to accommodate them to the peculiar nature of the thin glass, and the mode of laying and holding the same in a plane surface whilst being acted on, such plane surface not being retained by the thin glass when removed from the table; whereas, the plate glass being ground away into plane surfaces retains such planes after taking them off the table where they have been operated on. The substances which I prefer to use for the purpose of smoothing are emeries of six or seven degrees of fineness, obtained by grinding emery stone, and separating the different kinds by washing with water, in the usual manner, or in place of the coarser emery very fine sand may be used. Two sheets of glass are laid flat on damp level beds, as above described, and one table rests stationary in a horizontal position on a fixed vertical frame, and the other one being carefully reversed is laid glass against glass upon the other, and is then attached to the smoothing machine, as will be hereafter more particularly described, or the two surfaces may be worked by hand labour.

In employing machinery for performing the process of smoothing, the arrangement should be such that a line which bissects lengthways any horizontal section of the upper table, the centre of this line should be constrained to move in a straight line, while a point in the same line at a certain distance from this centre is made to describe a circle; the radius of such circle is arbitrary.

The machine being in motion, the workman commences with the coarsest emery powder or very fine sand; this he sprinkles on the lower glass, and assists its action by water. This operation is continued until both the glass surfaces in contact appear to be uniformly rubbed. The same process is repeated with each of the remaining emeries, which are used in the inverse order of their respective degrees of fineness. Each emery should be used until it has obliterated the scratches produced by the preceding one. The two sheets of

glass are afterwards turned and relayed by taking advantage of the bending properties, and their remaining faces or surfaces are treated in the same manner. If any defects of surface are observable when the glass leaves the smoothing process, the workman is to rub them away by hand, using for this purpose the finest emery and a small piece of glass. In removing a sheet of glass from a table, one of two modes may be resorted to:—First, by carefully lifting one edge and allowing the air to enter between the table and the sheet of glass till the whole surface is removed from the table, thus taking advantage of the bending capabilities of the glass, or the sheet of glass may be slided off the table.

The Polishing Process.

A thin sheet of glass is laid, as before explained, on a table covered with leather or other suitable material. The rubbers are prepared in the following manner:—A piece of wood (about 8 × 3 × $1\frac{3}{4}$ inches) is covered on one face with felt, a liquid or paste is made by mixing crocus or the red oxide of iron with water; this paste is rubbed upon the felt or thrown on to the glass by means of a brush or otherwise, and the rubbers are made to produce an uniform polish over the glass by hand, or by means of machinery.

Description of the Drawings of Machinery for Smoothing Thin Sheet of Glass.

Fig. 1 represents a front view of a smoothing machine. *a*, *a*, is a fixed horizontal table, having a sheet of thin glass laid on the upper surface thereof, as above explained; and *b*, *b*, is another table, having a sheet of glass laid on the under surface. The two surfaces of glass being parallel, owing to their being held in contact with two hard plane surfaces of the tables *a*, *b*, by taking advantage of the capability such thin glass has to bend, and to be laid even and retained in contact with the planes of the tables by the weight of the atmosphere resisting the glass assuming an irregular surface when it has been once smoothly laid and all the air driven out from between the glass and the table, hence the glass is at all parts kept in contact with the table and parallel with it, thus producing suitable plane surfaces to be rubbed together in the process of smoothing, which would not be the case if the ordinary means were resorted to for holding such thin sheets of glass as are pursued in holding sheets of plate glass, where level planes are obtained by grinding away the glass, and retaining such level planes without reference to the bed on which the glass is laid. *b*, *b*, is the framing of the machine, which should be strong and without vibration; *c*, *c*, are the legs of a platform, on which the stationary

table *a* is supported; *d* is an upright axis, turning in suitable bearings or brasses at *e*, *e*; and *f*, *f*, are pulleys for an endless band from a steam engine or other power, to give rotatory motion to the axis *d*, such pulleys being placed on the axis *d*; and *g* is a clutch box capable of sliding on the axis *d* on a feather, as is well understood; *h* being a lever by which a workman can put the clutch box into or out of connection with the pulleys, and consequently start or stop the machine. On the lower end of the axis *d* is affixed a crank *i*, as is shown in the Drawing. *j* is a bar having four openings; in the first opening is placed the crank pin *k*, by which the movement of the crank is connected with the bar *j*; but such movement of the bar is controlled in the following manner:—*l*, *l*, are two uprights affixed to the framing of the upper table *b*, which enter two of the holes or openings in the bar *j*, the bar being affixed to those uprights by set screws, as shewn, or otherwise; *m* is a bar which moves in bearings or guides *n*, *n*, and by such guides are controlled to move in a right line; *o* is an axis descending from the bar *m*, and enters the bar *j*, and allows of the bar *j* turning on that axis; hence, in the revolution of the crank *i*, the bar *j* is moved also, but the movement of the bar *j* is thus regulated and controlled by the axis *o*, which is in the centre of the upper table, moving at all times to and fro on a right line; by this means a compound movement will be obtained to the upper sheet of glass, compounded of the revolving motion of the crank and the right line movement of the axis *o*, about which the sheet of glass turns, as will be evident on examination of the Drawing.

Description of the Machinery employed in Polishing.

Figure 2 shews an elevation of a machine for polishing sheets of thin glass, the machine being arranged for operating on four tables at the same time; and the rubbing surfaces or polishing instruments are so arranged as to move in opposite directions, in order that any tendency which might be produced to slide the glass on the tables by one set of rubbing surfaces may be counteracted by the tendency of another set of rubbing surfaces moving in an opposite direction; and in addition to the to-and-fro movement of the rubbing surfaces, there is a movement communicated to the tables in a direction at right angles to the movement of the rubbing surfaces or polishing instruments.

Fig. 3 is a plan of the polishing machine, and Fig. 4 a transverse section thereof. In each of these Figures the same letters are employed to indicate similar parts; A, A, being the framing of the machine, and B, B, B, B, are the tables on which the glass is laid and kept even, as before explained. These tables are carried by two rectangular frames C, and affixed thereon by means of

set screws D, as is clearly shown in the Drawing. The frames C are capable of moving to and fro in the dovetail grooves formed in the guides E, which are carried by the framing of the machine, such dovetail grooves having filling pieces capable of being set up by screws, as is shewn; hence, the dovetail projections on the under side of the frame C work correctly in the grooves of the guides, and are retained in those guides by the filling pieces. F, F, are connecting rods, which are connected to the frames C by pin joints, as is shown by dotted lines, the other ends of such connecting rods move on axes at F^1, and have collars or straps which embrace excentrics affixed on the shaft G, as is clearly shewn; the shaft G turning in suitable bearings at H, carried by the framing of the machine; hence, when the shaft G receives rotatory motion, as hereafter described, motion is communicated to the tables C. And motion is communicated to the machine in the following manner:—I is a wheel, only partly shewn in the Drawing, which is driven by a steam engine or other power, the wheel I, taking into the wheel J, gives rotatory motion thereto. The wheel J being affixed on the axis K, there being a worm or screw affixed on the axis K, which drives the wheel L affixed on the shaft G, thus is motion obtained to the shaft G, and from it to the tables C; on the axis K, are formed two cranks M, N, which, by means of connecting rods P, Q, give motion to two rocking levers R, there being two levers R at each end of the machine, combined together by screw bolts T. From the upper parts of the rocking levers R proceed connecting rods V and W, W, such connecting rods being attached by pin joints to the frames X, Y, which carry the polishing surfaces Z, the frames X, Y, being carried in guides *a* which retain them upright. The polishing surfaces Z are applied to the frames X, Y, in the following manner:—Z^1 are projecting rods from the tops of the polishing instruments, which pass through guides Z^2 in the frames, there being a set screw to each rubber, in order to retain it up from the glass, when desired, such set screw passing through one of the guides Z^2, as shown. On each side of the bars Z^1 is a projecting stud, which is pressed on by a lever Z^3, having its axis on a polishing frame, such lever being borne upon by a spring Z^4, which is affixed to the frames X or Y, one spring to each polishing instrument, and there is a set screw passed through each spring by which the degree of pressure is regulated. The machine, when set to work, will evidently cause the polishing intrements Z, carried by the frame X, to move at all times in an opposite direction to the polishing instruments on the frames Y, which is important where the glass is held level, according to the

means above described. In working this machine the workman puts on the polish mixture from time to time by a brush or otherwise.

Having thus described the nature of my Invention, and the manner in which the same is to be performed, I would remark, that I make no claim to any of the parts of the machinery, or the combinations thereof, which have been before used either for the polishing of glass or other purposes, and I am aware that attempts have been made to grind smooth and polish square or small sheets of thin glass by pursuing like means to those resorted to for grinding, smoothing, and polishing plate glass, but I believe without success. I do not claim the grinding, smoothing, and polishing thin glass generally, but only a mode of doing so, as herein described.

I will now proceed to explain the mode of preventing or reducing the enlarged external edge or boundary of tables of crown glass. In making crown glass, as is well understood, a solid mass of metal (melted glass) having been collected at the end of a hollow pipe (as shewn at Fig. 5), is expanded by the operations of "marvering" (or rolling on a flat metallic slab), blowing, and heating into a hollow spheriodal globe, which is joined to the pipe by a hollow cylindrical piece of metal (A), termed the neck. The globe being completed, a rod, named a punt, is attached to the bullion or part B of the globe, which is exactly opposite to its neck, and this neck being broken transversely, in order to disengage the pipe, a circular aperture is left of about two to three inches diameter. The hollow globe of metal is then exposed to the flames of an open fire, and the punt which holds it being twirled or revolved round in the workman's hand, as is well understood. The globe is spread by centrifugal force, and a table or circular plate is produced, the neck forming the periphery or external boundary or ring of the table.

Now, the thickness of this selvage is generally much greater than that of the rest of the table, excepting the bull's eye or central portion, and the adjacent parts, a circumstance which both increases the cost and diminishes the value of the glass. The thickness of this selvage depends on the diameter and substance of the necks, and varies, as they vary.

The nature of my improvement consists in the reduction of the thickness of the said selvage by diminishing, with much greater certainty than can be attained by the present modes, both the diameter and substance of the neck, and this latter diminution is effected by the simple contrivance of turning or rolling the neck, while in a hot ductile state, on a wooden bar or surface.

Having selected a piece of soft wood, such as that of the pear tree, I cause a bar to be cut from it about six feet long, six inches wide, and one inch

thick, and on one edge of this bar are cut, transversely to its length, small grooves (to receive the necks) at convenient intervals, about two inches wide by three-quarters of an inch in depth. This bar is placed with one face close against that edge of the blowers "marver," which is furthest from and opposite to the workman, the grooved edge being uppermost, and about three inches above the top of the marver, and it is fixed in this position horizontally in such a manner that one end of the bar is moveable on an axis, while the other end rests on a pin, which may be removed and replaced at pleasure. Suppose, then, that the blower is about marvering a globe before the process, the boy who attends on purpose removes the pin, and allows the bar to drop below the marver, but when the blower has finished the marvering, the boy raises the bar into a horizontal position, and replaces the pin beneath it, and the blower having placed the neck of the globe on one of the aforesaid grooves, turns it round in the same, and continues blowing until both the diameter and substance of the neck appear to be sufficiently reduced, which the workman with a little practice will readily judge of, the boy then drops the bar, and the boy, during the interval between two operations, ought to wipe the marver clean from the small particles which escape from the wood, and also keep the edge of the bar moistened by a wet sponge.

In witness whereof, I, the said James Timmins Chance, have hereunto set my hand and seal, this Nineteenth day of October, One thousand eight hundred and thirty-eight.

JAMES TIMMINS CHANCE. (L.S.)

AND BE IT REMEMBERED, that on the Nineteenth day of October, in the year of our Lord 1838, the aforesaid James Timmins Chance came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

Inrolled the Twentieth day of October, in the year of our Lord One thousand eight hundred and thirty-eight.

LYNCH.

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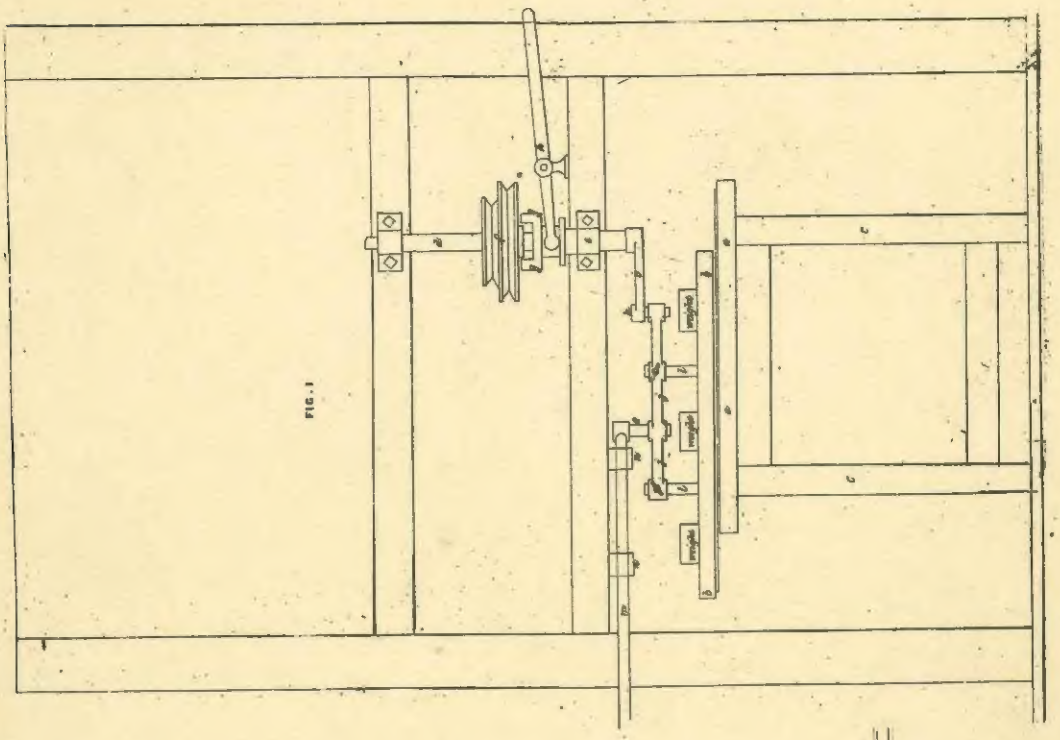
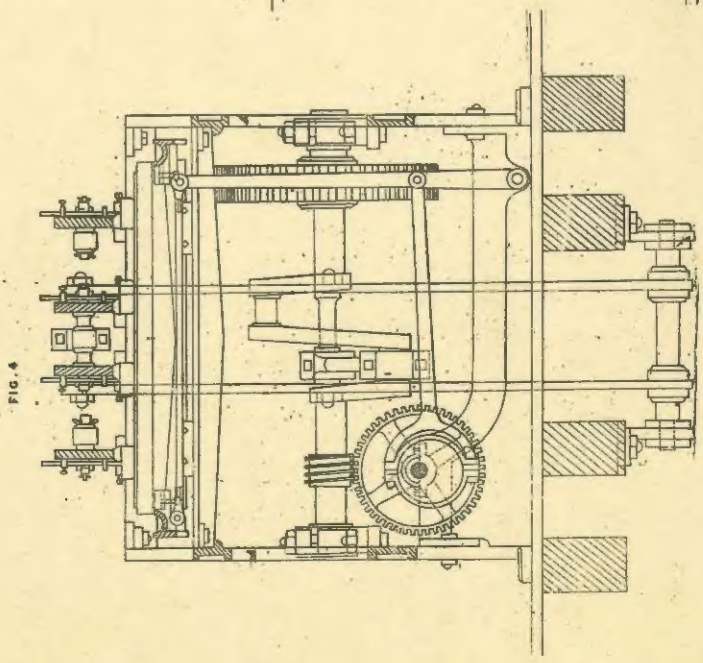
51/26

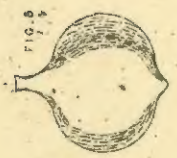
51. GRINDING AND POLISHING.
Glass and Stone.
Curved Surfaces.

Britain 1938

British # 7618
Date 4-21-'38
Name Chance







A. D. 1938. Apr. 21. No. 7618.
CHANCE'S SPECIFICATION